

CLAIM AMENDMENTS
CLEANED UP AND RENUMBERED

1. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
a single metal or metal hydride support, wherein
one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the area-specific resistance for protons is in the range of $0.01\text{-}100\ \Omega\cdot\text{cm}^2$ at at least one temperature between 220°C and 550°C ,
wherein the metal or metal in the metal hydride is selected from the group consisting of Pd, PdAg, PdCu, Ti, LaNi₅, TiFe and CrV₂, V/Ni/Ti, V/Ni and V/Ti.

2. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
a single metal or metal hydride support, wherein
one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the area-specific resistance for protons is in the range of $0.01\text{-}100\ \Omega\cdot\text{cm}^2$ at at least one temperature between 220°C and 550°C ,
wherein the electronically-insulating proton conductor coating is selected from the group consisting of:

mesoporous zirconium phosphate pyrophosphate, $\text{Zr}(\text{P}_2\text{O}_7)_{0.81}$;

$\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}\cdot\text{H}_2\text{O}$;

$\text{Cs}_5\text{H}_3(\text{SO}_4)_4\cdot 0.5\text{H}_2\text{O}$;

a hydrate of SnCl_2 ;

silver iodide tetratungstate $\text{Ag}_{26}\text{I}_{18}\text{W}_4\text{O}_{16}$;

KH_2PO_4 ;

tetraammonium dihydrogen triselenate, $(\text{NH}_4)_4\text{H}_2(\text{SeO}_4)_3$;

CsDSO_4 ;

CsH_2PO_4 ;

$\text{Sr}[\text{Zr}_{0.9}\text{Y}_{0.1}]\text{O}_{3-\delta}$;

a silica-polyphosphate composite containing ammonium ions;

$\text{La}_{0.9}\text{Sr}_{0.1}\text{Sc}_{0.9}\text{Mg}_{0.1}\text{O}_3$; and

$\text{BaCe}_{0.9-x}\text{Zr}_x\text{M}_{0.1}\text{O}_{3-\delta}$ where M is Gd or Nd and $x = 0$ to 0.4 .

3. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
a single metal or metal hydride support, wherein
one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the area-specific resistance for protons is in the range of 0.01 - $100 \Omega\cdot\text{cm}^2$ at at least one temperature between 220°C and 550°C ,

wherein the electronically-insulating proton-conducting coating consists of

$\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}\cdot\text{H}_2\text{O}$;

CsH_2PO_4 ;

$\text{Sr}[\text{Zr}_{0.9}\text{Y}_{0.1}]\text{O}_{3-\delta}$;

polyphosphate composite containing $19.96 \text{ wt}\% \text{NH}_4^+$, $29.3 \text{ wt}\% \text{P}$, $1.51 \text{ wt}\% \text{Si}$;

$\text{La}_{0.9}\text{Sr}_{0.1}\text{Sc}_{0.9}\text{Mg}_{0.1}\text{O}_3$; or

$\text{BaCe}_{0.9-x}\text{Zr}_x\text{M}_{0.1}\text{O}_{3-\delta}$ where M is Gd or Nd and $x = 0$ to 0.4 .

4. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
a single metal or metal hydride support, wherein
one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the area-specific resistance for protons is in the range of 0.01 - $100 \Omega\cdot\text{cm}^2$ at at least one temperature between 220°C and 550°C ,

wherein the area-specific resistance for protons at at least one temperature between 220°C and 550°C is about $0.150 \Omega \cdot \text{cm}^2$.

5. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
 a single metal or metal hydride support, wherein
 one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the ASR for protons at at least one temperature between 220°C and 550°C is in the range shown for Nafion® 117 in Figure 10:

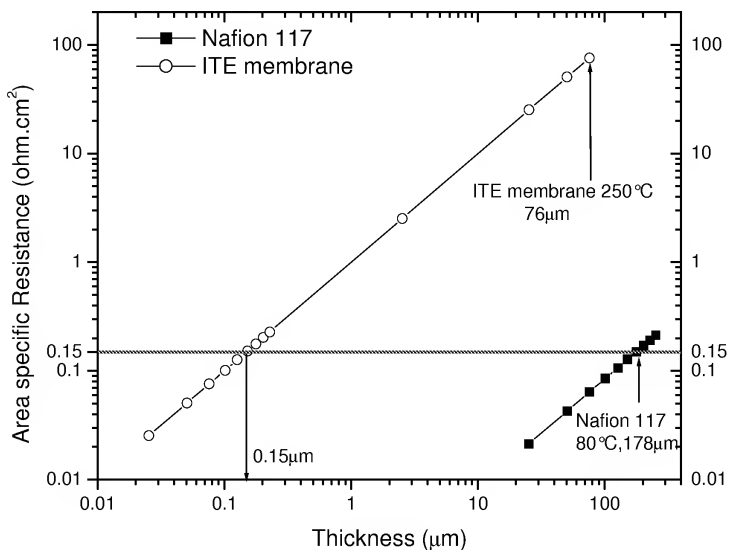


Figure 10;

wherein the metal or metal in the metal hydride is selected from the group consisting of Pd, PdAg, PdCu, Ti, LaNi₅, TiFe and CrV₂, V/Ni/Ti, V/Ni and V/Ti.

6. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of
 a single metal or metal hydride support, wherein
 one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the ASR for protons at at least one temperature between 220°C and 550°C is in the range shown for Nafion® 117 in Figure 10:

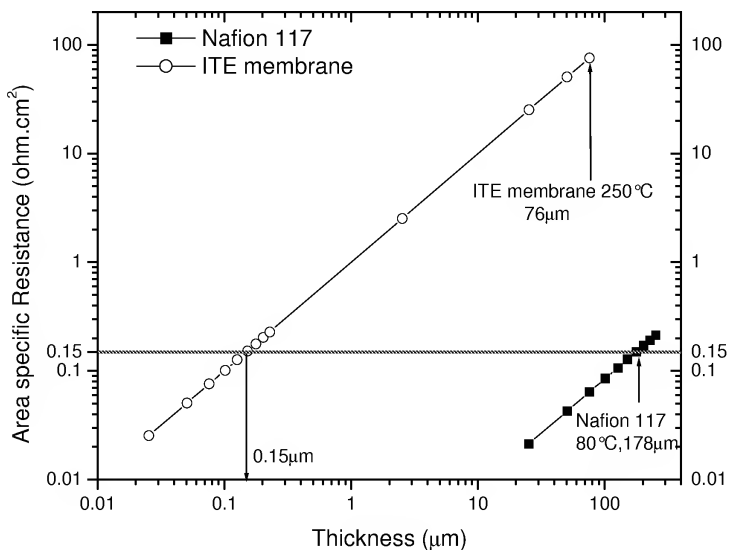


Figure 10;

wherein the electronically-insulating proton-conducting coating is selected from the group consisting of:

mesoporous zirconium phosphate pyrophosphate, $\text{Zr}(\text{P}_2\text{O}_7)_{0.81}$;

$\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}\cdot\text{H}_2\text{O}$;

$\text{Cs}_5\text{H}_3(\text{SO}_4)_4\cdot 0.5\text{H}_2\text{O}$;

a hydrate of SnCl_2 ;

silver iodide tetratungstate $\text{Ag}_{26}\text{I}_{18}\text{W}_4\text{O}_{16}$;

KH_2PO_4 ;

tetraammonium dihydrogen triselenate, $(\text{NH}_4)_4\text{H}_2(\text{SeO}_4)_3$;

CsDSO_4 ;

CsH_2PO_4 ;

$\text{Sr}[\text{Zr}_{0.9}\text{Y}_{0.1}]\text{O}_{3-\delta}$;

a silica-polyphosphate composite containing ammonium ions;

$\text{La}_{0.9}\text{Sr}_{0.1}\text{Sc}_{0.9}\text{Mg}_{0.1}\text{O}_3$; and

$\text{BaCe}_{0.9-x}\text{Zr}_x\text{M}_{0.1}\text{O}_{3-\delta}$ where M is Gd or Nd and $x = 0$ to 0.4 .

7. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of

a single metal or metal hydride support, wherein

one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the ASR for protons at at least one temperature between 220°C and 550°C is in the range shown for Nafion® 117 in Figure 10:

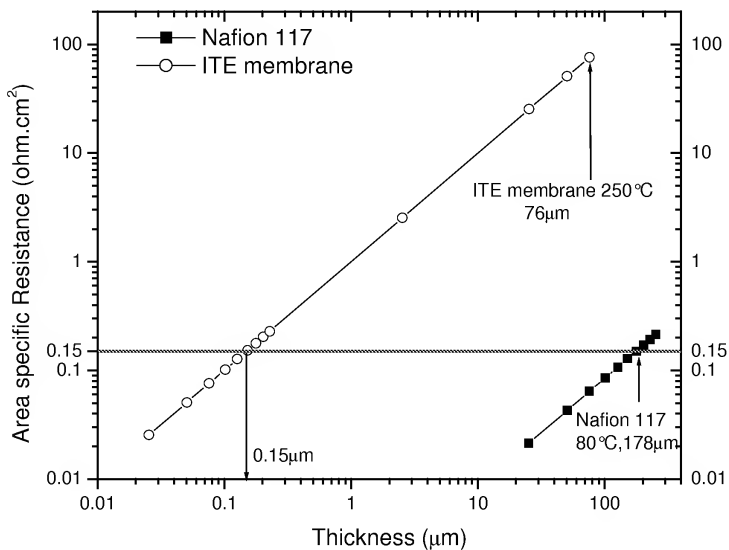


Figure 10;

wherein the electronically-insulating proton-conducting coating consists of

$$\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}\text{-H}_2\text{O};$$

CsH_2PO_4 ;

$\text{Sr}[\text{Zr}_{0.9}\text{Y}_{0.1}]\text{O}_{3-\delta}$;

polyphosphate composite containing 19.96 wt% NH_4^+ , 29.3 wt% P, 1.51 wt% Si;

$\text{La}_{0.9}\text{Sr}_{0.1}\text{Sc}_{0.9}\text{Mg}_{0.1}\text{O}_3$; or

$\text{BaCe}_{0.9-x}\text{Zr}_x\text{M}_{0.1}\text{O}_{3-\delta}$ where M is Gd or Nd and $x = 0$ to 0.4.

8. A proton-conducting membrane designed to serve as an electrolyte in a fuel cell, which membrane consists essentially of

a single metal or metal hydride support, wherein

one or both faces of said support is coated with an electronically-insulating proton-conducting coating, which coating consists of an inorganic material that contains no liquid phase, said coating having a thickness such that the ASR for protons at at least one temperature between 220°C and 550°C is in the range shown for Nafion® 117 in Figure 10:

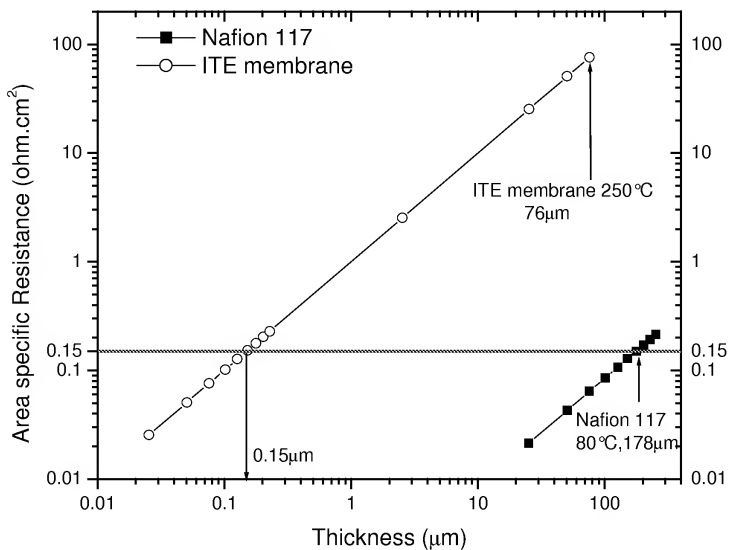


Figure 10;

wherein the area-specific resistance for protons at at least one temperature between 220°C and 550°C is about 0.150 Ω.cm².